



# United States Department of the Interior

U. S. GEOLOGICAL SURVEY  
WESTERN FISHERIES RESEARCH CENTER  
COLUMBIA RIVER RESEARCH LABORATORY  
5501A Cook-Underwood Road  
Cook, WA 98605  
(509) 538-2299

**A. Title:** Application for a Permit for Scientific Purposes Under the Endangered Species Act of 1973. I. Effects of Urbanization of Nearshore Ecosystem in Puget Sound, Washington: Pilot Study in an Urban Embayment. II. U.S. Geological Survey Integrated Science Plan to Support Restoration of Puget Sound Deltas: The Skagit Delta – Whidbey Basin Study

**B. Species:** PS Chinook salmon

**C. Date of Permit Application:** June 30, 2006

**D. Applicant Identity:**

Section Leader: Dennis W. Rondorf  
Email: dennis\_rondorf@usgs.gov

Principal Investigator: Theresa L. Liedtke  
Email: theresa\_liedtke@usgs.gov

ESA Permit Coordinator: Dena M. Gadomski,  
Email: dena\_gadomski@usgs.gov

U. S. Geological Survey  
Western Fisheries Research Center  
Columbia River Research Laboratory  
5501-A Cook-Underwood Road  
Cook, WA 98605  
Phone: (509) 538-2299  
Fax: (509) 538-2843

**E. Information on Personnel, Cooperators, and Sponsors.**

*Lead Agency:* U. S. Geological Survey  
Western Fisheries Research Center  
Columbia River Research Laboratory  
5501-A Cook-Underwood Road  
Cook, WA 98605

*Scientists:* Theresa L. Liedtke, Principal Investigator, Research Fish Biologist  
[theresa\\_liedtke@usgs.gov](mailto:theresa_liedtke@usgs.gov), 509.538.2299 x 270  
Reginald Reisenbichler, Principal Investigator, Research Fish Biologist  
[reginald\\_reisenbichler@usgs.gov](mailto:reginald_reisenbichler@usgs.gov), 206.526.6282 x 334  
Paul Hershberger, Principal Investigator, Research Fish Biologist  
[paul\\_hershberger@usgs.gov](mailto:paul_hershberger@usgs.gov), 360.385.1007 x 225  
Jeff Duda, Principal Investigator, Research Fish Biologist  
[jeff\\_duda@usgs.gov](mailto:jeff_duda@usgs.gov), 206.526.6282 x 233  
Collin D. Smith, Field Supervisor, Fishery Biologist  
[collin\\_smith@usgs.gov](mailto:collin_smith@usgs.gov), 509.538.2299 x 355  
Eric Grossman, Research Geologist  
Anthony Paulson, Research Hydrologist  
Lynn Koontz, Economist  
Steve Rubin, Fishery Biologist  
Nancy Elder, Fishery Biologist  
Mike Hayes, Fishery Biologist  
Angie Lind-Null, Fishery Biologist  
Karl Stenberg, Fishery Biologist  
Kim Larsen, Fishery Biologist  
L. Lamb, Fishery Biologist  
P. Ponds, Fishery Biologist  
E. Swann, Fishery Biologist  
B. Rosenbauer, Geologist  
R. Takesue, Geologist  
F. Hostettler, Geologist  
M. McGann, Geologist  
B. Orem, Geologist  
G. Hatcher, Geologist  
J. Ferreira, Geologist  
G. Gelfenbaum, Geologist  
W. Labiosa, Geographer  
M. Mastin, Hydrologist  
S. Cox, Hydrologist  
J. Higgins, Hydrologist  
C. Currin, Hydrologist  
J. Paulat, Hydrologist  
D. Miller, Hydrologist

*Field Personnel:*

Ryan Tomka, Biological Science Technician  
Lisa Gee, Biological Science Technician  
Toby Koch, Fishery Biologist  
Michael Kritter, Fishery Biologist  
Israel Duran, Fishery Biologist  
Brian Eckstrom, Biological Science Technician

*Sponsor:*

U. S. Geological Survey  
Western Fisheries Research Center  
Columbia River Research Laboratory  
5501-A Cook-Underwood Road  
Cook, WA 98605  
509.538.2299

*Cooperators:* Paul Dorn, Salmon Recovery Coordinator

Suquamish Tribal Fisheries Department,  
P.O. Box 498  
Suquamish, WA 98392  
360.394.8441

Kathleen and Luis Barrantes  
Liberty Bay Foundation  
Lemolo Citizens Club  
17212 Lemolo Shore Drive NE  
Poulsbo, WA 98370  
360.697.5815

Eric Beamer  
Skagit River System Cooperative  
11426 Moorage Way  
La Conner, WA 98257  
360.466.7241

Kurt Fresh  
NOAA Fisheries  
7600 Sand Point Way NE  
Seattle, WA 98115-0070  
206.860.6793

*Disposition of Specimens:*

In each study, salmonids will not be collected, however they may be inadvertently captured and released immediately.

### **Effects of Urbanization of Nearshore Ecosystem in Puget Sound**

Incidental mortalities (not to exceed 5%) of listed fish will be put on ice and delivered to the U.S. Fish and Wildlife Service's Lower Columbia River Fish Health Center, which will provide a thorough disease profile. These data will provide an important baseline on the health of existing fish populations in the selected sites.

Unlisted specimens collected from Liberty Bay, Puget Sound, will be placed on ice and delivered to the U.S. Geological Survey Columbia River Research Laboratory. Samples will be stored in a laboratory freezer prior to drying (at 60°C) and prepared for stable isotope analysis. These data will provide important information on nitrogen inputs from nearby watersheds, effectively used as indicators of anthropogenic eutrophication. The prepared samples will be shipped to the contact below for analysis.

David Harris

UC Davis Stable Isotope Facility

Department of Plant Sciences

One Shields Avenue, Mail Stop 1

Davis, CA 95616 USA

Ph: 530.754.7517

Fax: 530.752.4361

Email: [dharris@ucdavis.edu](mailto:dharris@ucdavis.edu)

### **The Skagit Delta – Whidbey Basin Study**

No (listed or unlisted) live specimens will not be transported or held. Incidental catches will be released back where they were captured immediately after capture. Any incidental mortalities of listed fish will be retained at Western Fisheries Research Center. The fish will be preserved in 95% ethanol until they are dissected and their otoliths removed. We will canvas actual and potential collaborators at NOAA Fisheries (Northwest Science Center), University of Washington (School of Fisheries, including Dave Beauchamp, 206-221-5791), Skagit River System Cooperative, and Washington Department of Fish and Wildlife to determine whether the fish bodies can be of any use to them in other investigations.

### **F. Project Description, Purpose, and Significance:**

A copy of the project proposal and a statement of work for each study are included.

1. The overall objective of the proposed project is to conduct a small-scale, proof-of-concept study to test the design and field methodologies for a multi-year, comprehensive future study exploring the impacts of large river deltas and urbanization on nearshore ecosystem processes. The pilot study will demonstrate whether some of the concepts being considered for the future comprehensive study plan are feasible. Specifically, we expect to learn whether urban metrics can be developed that show promise for eventually allowing analysis of cause-and-effect relationships and we also expect to demonstrate field and laboratory capabilities, to identify capabilities that need to be developed, and to test whether the pilot-study design elements, timing, and

intensity were appropriate for addressing research objectives. The lessons learned from the pilot study will assist in the development of a future comprehensive study plan for exploring impacts of urbanization on nearshore ecosystem processes throughout Puget Sound. This will be a multi-part pilot study that addresses the hypothesis that physio-chemical processes related to urbanization degrade nearshore habitat and result in an altered trophic web, community dynamics, and forage fish populations.

2. Congress funded the U.S. Geological Survey (USGS) to initiate the Coastal Habitats in Puget Sound (CHIPS) project to assist with the Puget Sound Restoration Project (PSRP). PSRP was initiated by a broad-based partnership to address impairment of nearshore processes and habitat, specifically by identifying significant ecosystem problems, evaluating potential solutions, and restoring and preserving critical nearshore habitat (Puget Sound Nearshore Partnership, 2005). Members of this partnership, called the Puget Sound Nearshore Partnership (PSNP), include the U.S. Army Corps of Engineers, USGS, other Federal and State agencies, tribes, the commercial sector, environmental organizations, universities and numerous local governments. The role of the USGS is to help develop scientific information to better understand the processes that affect nearshore ecosystem health and tools that facilitate optimal management of nearshore zones now and in the future as the human population continues to increase. This proposal outlines the first step in this process: a small-scale, proof-of-concept pilot study in preparation of the development of a future comprehensive study plan.
3. A better understanding is needed of the fundamental physical, chemical, biological, and human processes that occur in nearshore ecosystems of Puget Sound, the superimposed anthropogenic stressors that impact nearshore processes and function, and how this impact occurs. Improved insight into these issues will assist our partners and resource managers with adaptive management of the Puget Sound ecosystem and starts to address two goals of the research plan of the Puget Sound Restoration Project: 1) understand nearshore ecosystem processes and linkages to watershed and marine systems, and 2) understand the effects of human activities on nearshore ecosystem processes.
4. **Effects of Urbanization of Nearshore Ecosystem study:**  
The Suquamish Tribal Fisheries Department has been conducting research in central Puget Sound (including Liberty Bay) as a part of the 2006 Tribal Research Plan. In an effort to initiate the pilot study and better understand the study area, USGS assisted Suquamish Tribal Fisheries in their beach seining efforts in spring and summer of 2006. We will continue to coordinate any beach seining efforts with the Suquamish tribe to minimize impact to the embayment.  
**The Skagit Delta – Whidbey Basin study:**  
We are collaborating with the Skagit River System Cooperative who have provided the samples of Chinook salmon that will be used for otolith work in this study, and they or NOAA Fisheries will conduct any field activities targeted at Chinook salmon. The only Chinook salmon that would be killed under this request from USGS are incidental

mortalities that might occur as we sample various forage fishes in nearshore habitats with seines and other nets, and inadvertently capture juvenile salmon.

5. N/A

**G. Project Methodology:**

1. This project is scheduled to begin December 2006 and projected to continue through December 2011. A pilot study will be conducted to help develop the conceptual understanding, operational hypotheses, and experimental design required to address some of these long-term questions:
  - Has armoring significantly changed nearshore community structures? If so, what aspects of armoring have most impacted ecosystems and should therefore be targeted in restoration efforts? Are ecological impacts of armoring similar in protected embayments and along open shore?
  - Have changes in outputs from watersheds changed nearshore community structures? If so, what changes have most impacted ecosystems and how are these changes tied to management practices in the watershed? Are ecological impacts from watershed development more significant than those from shoreline development?
  - What anthropogenic, physical, chemical and biological factors critically influence nearshore ecosystem health, and how can we quantify and qualify these factors across the terrestrial and marine environment? Given the diversity of ecosystem conditions and settings in Puget Sound, how can we ensure that our science adequately addresses the restoration and monitoring needs of Puget Sound, the public, and our partners?
  - What ecosystem effects stem from specific economic activities? What is the spatial distribution of economic activities and their associated disturbance and construction? What indicators best express causal connections? What are the pathways of influence and attenuation of influence along the pathways? What is the history of development and what is the current rate of change, by economic sector?

The results of the pilot will allow us to better design a future comprehensive study plan to be implemented over a number of years. The study area will include waterways and inlets in east Kitsap County and the Skagit Delta-Whidbey Basin.

2. Procedures and techniques:

**Effects of Urbanization of Nearshore Ecosystem in Puget Sound**

- Specimens will be captured using a variety of methods (for details, see Table 1.)
- All target species will be checked for tags (if applicable), placed in a sealed sample bag or container, packed on dry ice, and prepared for transport to the Columbia River Research Laboratory.
  - a. Refer to Table 1. for a comprehensive list of species and capture methods. Incidental catches will be released back where they were captured immediately after capture. We will take care to avoid salmon and other listed species when beach seining and angling. Specific bait and lures will be used to target our

sampling efforts so we do not expect to encounter salmonids. If salmonids are encountered we will stop collecting in that area.

- b. Sampling will be conducted over 1 to 2 three day periods each quarter in inlets and waterways in east Kitsap County, including Liberty Bay, Port Orchard, Dyes Inlet, and Sinclair Inlet.
- c. No tagging or marking of specimens will be conducted in this study.
- d. No drugs or anesthetics will be applied in this study.

**The Skagit Delta – Whidbey Basin Study**

- Specimens (eelgrass and forage fishes) will be captured using a variety of methods (Table 1.)
  - All target species will be checked for tags (if applicable), placed in a sealed sample bag or container, packed on dry ice, and prepared for transport to the Western Fisheries Research Center, 6505 NE 65th Street, Seattle, Washington 98115.
  - e. Incidental catches will be released back where they were captured immediately after capture. We will take care to avoid salmon and other listed species when beach seining and angling. Specific bait and lures will be used to target our sampling efforts so we do not expect to encounter salmonids.
  - f. Sampling will be conducted over 1 to 2 three day periods each quarter in inlets and waterways in the Skagit Delta - Whidbey Basin.
  - g. No tagging or marking of specimens will be conducted in this study.
  - h. No drugs or anesthetics will be applied in this study.
- 3. Multiple collection methods are identified for our targeted species which enable our field staff to adapt to changes in environmental conditions and the extensive species list offers flexibility to collect species that are plentiful (allowing for annual variations in species abundance).
  - 4. During angling and beach seining, there is a potential to injure or kill fish that are encountered. To minimize injury and mortality, the seined catch will be evaluated immediately and non-targeted species will be sorted out. Non-targeted species will not be removed from the water to minimize handling stress. When angling, small single hooks will be used rather than treble hooks to reduce injury to any part of the fish body.

**H. Description and Estimates of Take: (see Table 2.)**

- 1. Request approval for incidental mortality of 27 juvenile fish from the Puget Sound Chinook salmon ESU and to handle 550 live, incidentally caught fish during beach seining efforts, for scientific purposes. No salmon will be sacrificed intentionally. Incidental catches will be released back where they were captured immediately after capture. We currently do not possess additional data, on the status and trend of this ESU.
- 2. No USFWS listed species will be affected.

**I. Transportation and Holding:**

We will not be transporting or holding live listed specimens. Incidental catches will be released back where they were captured immediately after capture.

**J. Cooperative Breeding Program:**

As appropriate, we are willing to participate in a cooperative breeding program and will maintain or contribute data to a breeding program if such action is requested.

**K. Previous or Concurrent Activities Involving Listed Species:**

Section 10 Permits 1130, 1291; 2000 FCRPS Biological Opinion Research Action 1130; 2000 & 2004 FCRPS Biological Opinion Letters of determination USGS-04-24, USGS-05-17 USGS-06-04, USGS-06-18.

Listed species involved: UCR spring Chinook wild and hatchery, SR S/S Chinook wild and hatchery, SR fall Chinook wild, LCR Chinook wild, UCR steelhead wild and hatchery, SR steelhead wild and hatchery, MCR steelhead wild, LCR steelhead wild, SR Sockeye.

**L. Certification:**

I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand this information is submitted for the purpose of obtaining a permit under the Endangered Species Act of 1973 (ESA) and regulations promulgated thereunder, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or to penalties under the ESA.

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Signature

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Date

Theresa L. Liedtke  
Research Fishery Biologist



**Table 1. List of species and collection methods**

	<b>Common Name</b>	<b>Species</b>	<b>Annual Number of Fish Requested</b>	<b>Location</b>	<b>Collection Method</b>
1	Pacific herring	<i>Clupea pallasii</i>	1000	East Kitsap County	Beach seining, angling, dip or cast netting
2	Surf smelt	<i>Hypomesus pretiosus</i>	1000	East Kitsap County	Beach seining, angling, dip or cast netting
3	Plainfin midshipman	<i>Porichthys notatus</i>	10	East Kitsap County	Beach seining
4	Threespine stickleback	<i>Gasterosteus aculeatus</i>	10	East Kitsap County	Beach seining
5	misc. greenlings	Hexagrammidae	20	East Kitsap County	Beach seining
6	Staghorn sculpin	<i>Leptocottus armatus</i>	500	East Kitsap County	Beach seining
7	Buffalo sculpin	<i>Enophrys bison</i>	20	East Kitsap County	Beach seining
8	Tadpole sculpin	<i>Psychrolutes paradoxus</i>	20	East Kitsap County	Beach seining
9	misc. sculpins	misc. Cottidae	20	East Kitsap County	Beach seining
10	Shiner perch	<i>Cymatogaster aggregata</i>	500	East Kitsap County	Beach seining, angling
11	Striped perch	<i>Embiotoca lateralis</i>	100	East Kitsap County	Beach seining, angling
12	misc. perch	Embiotocidae	50	East Kitsap County	Beach seining, angling
13	misc. gunnels	Pholidae	25	East Kitsap County	Beach seining
14	Pacific sandlance	<i>Ammodytes hexapterus</i>	1000	East Kitsap County	Beach seining, angling, dip or cast netting
15	Pacific sanddab	<i>Citharichthys stigmaeus</i>	10	East Kitsap County	Beach seining, angling
16	Starry flounder	<i>Platichthys stellatus</i>	50	East Kitsap County	Beach seining, angling
17	Rock sole	<i>Lepidopsetta bilineata</i>	20	East Kitsap County	Beach seining, angling
18	English sole	<i>Pleuronectes vetulus</i>	50	East Kitsap County	Beach seining, angling
19	Sand sole	<i>Psettichthys melanostictus</i>	20	East Kitsap County	Beach seining, angling
20	Butter sole	<i>Pleuronectes isolepis</i>	20	East Kitsap County	Beach seining, angling
21	CO turbot	<i>Pleuronichthys coenosus</i>	20	East Kitsap County	Beach seining, angling
22	misc. flatfish	misc. Pleuronectidae	25	East Kitsap County	Beach seining, angling
23	Spiny dogfish	<i>Squalus acanthias</i>	50	East Kitsap County	Beach seining, angling
24	misc. rockfishes	<i>Sebastes</i> spp.	25	East Kitsap County	Beach seining, angling
25	Cabezon	<i>Scorpaenichthys marmoratus</i>	10	East Kitsap County	Beach seining, angling
26	Blackbelly eelpout	<i>Lycodopsis pacifica</i>	10	East Kitsap County	Beach seining
27	misc. copepods	<i>Pseudocalanus</i> spp.	100	East Kitsap County	Beach seining, snorkeling, diving
28	Dungeness crab	<i>Cancer magister</i>	25	East Kitsap County	Snorkeling, diving, crab pots/rings
29	misc. hermit crabs	<i>Paguristes</i> spp.	50	East Kitsap County	Snorkeling, diving, hand collection

	Common Name	Species	Annual Number of Fish Requested	Location	Collection Method
30	Sidestripe shrimp	Pandalopsis dispar	50	East Kitsap County	Snorkeling, diving, shellfish raking
31	Pink shrimp	Pandalus borealis	50	East Kitsap County	Snorkeling, diving, shellfish raking
32	Pacific oyster	Crassostrea gigas	50	East Kitsap County	Snorkeling, diving, shellfish raking
33	Pacific littleneck clam	Protothaca staminea	50	East Kitsap County	Snorkeling, diving, shellfish raking
34	Pacific gaper	Tresus nuttallii	50	East Kitsap County	Snorkeling, diving, shellfish raking
35	Japanese littleneck clam	Tapes philippinarum	50	East Kitsap County	Snorkeling, diving, shellfish raking
36	Softshell clam	Mya arenaria	50	East Kitsap County	Snorkeling, diving, shellfish raking
37	Blue mussel	Mytilus edulis Linnaeus	50	East Kitsap County	Snorkeling, diving, hand collection
38	Snail	Batillaria spp.	50	East Kitsap County	Snorkeling, diving, hand collection
39	Common sunstar	Crossaster papposus	50	East Kitsap County	Snorkeling, diving, hand collection
40	Purple sea star	Pisaster ochraceus	50	East Kitsap County	Snorkeling, diving, hand collection
41	Eelgrass	Zostera marina	n/a	East Kitsap County	Grapple hook, hand collection
42	Rockweed	Fucus gardneri	n/a	East Kitsap County	Grapple hook, hand collection
43	Red algae	Gracilariopsis spp.	n/a	East Kitsap County	Grapple hook, hand collection
44	Sea lettuce	Ulva spp.	n/a	East Kitsap County	Grapple hook, hand collection
45	Rockweed isopod	Idotea wosnesenskii	25	East Kitsap County	Snorkeling, diving, hand collection
46	Zooplankton		n/a	East Kitsap County	Plankton tow
47	Chinook salmon	Oncorhynchus tshawytscha	*	East Kitsap County	Beach seining, angling
48	Coho salmon	Oncorhynchus kisutch	20	East Kitsap County	Beach seining, angling
49	Chum salmon	Oncorhynchus keta	20	East Kitsap County	Beach seining, angling
50	Cutthroat trout	Oncorhynchus clarki	20	East Kitsap County	Beach seining, angling
51	Steelhead trout	Oncorhynchus mykiss	20	East Kitsap County	Beach seining, angling

\* See Table 2. Anticipated Annual Take for listed species

## Details of Collection Methods

### 1. Beach seining

One end of a 200' seine will be anchored to a point on land as the rest of the seine is dropped into the water off the stern of a boat that slowly arcs to another location of the beach. Once the entire seine is in the water, simultaneously both ends of the seine will be

manually hauled onto the beach. The pocket of the seine will be kept offshore, in water, to minimize handling stress while specimens are collected.

2. Angling (hook and line)

Sabiki rigs (hook sizes from #4 to #8) occasionally baited with squid will be tied to line, and weighted with zero to 2 ounces. Sabiki rigs will be deployed with spinning rods. Other bottom-fish rigs may be applied as needed.

3. Dip or cast netting

A school of forage/bait fish will be approached by boat. The engine will be turned off to allow the boat to skim (or coast) through the school of fish. To dip net, a long-handled net (1/4" mesh) will be "dipped" into the school of fish and scooped upward into the boat and placed in a container full of water. To cast net, a circular net (10' diameter) weighted along the edges will be thrown over the school of bait fish and allowed to sink for about 5 seconds. When the net is reined in, it creates a balloon enclosure, capturing the fish. The net is hauled in towards the boat, brought onboard, and the net is opened to release the fish into a container filled with water.

4. Snorkeling

Some invertebrates may be collected using this method if the specimens are located in deeper waters inaccessible by wading. When snorkeling, specimens will only be collected by hand and then placed in a mesh sample bag until brought onboard the vessel, where specimens will be sorted from a container filled with water.

5. Diving

Some invertebrates may be collected using this method if the specimens are located in deeper waters inaccessible by snorkeling. When snorkeling, specimens will only be collected by hand and then placed in a mesh sample bag until brought onboard the vessel, where specimens will be sorted from a container filled with water. Diving will be performed by U.S. Geological Survey certified scuba divers.

6. Crab pots/rings

Recreational-sized crab pots or rings baited with non-listed fish will be deployed from the vessel and thrown into the water. The pots/rings will be left to "soak" for an hour and then hauled up to the surface. Specimens will be sorted from the pot/ring and incidental catch will be released immediately.

7. Hand collection

Specimens may be plucked (from eelgrass beds, from rocks, etc.) picked or scooped from substrate. Specimens will be collected and placed in a mesh sample bag or bucket until brought onboard the vessel, where specimens will be sorted from a container filled with water.

8. Shellfish raking

A hand trowel and rake may be used to rake gravel or sand beds to collect specimens. Specimens will be collected and placed in a mesh sample bag or bucket until brought onboard the vessel, where specimens will be sorted from a container filled with water.

9. Grapple hook

To collect eelgrass, we may opt to utilize a grapple hook to pick eelgrass from beds or collect eelgrass adrift that may otherwise be out of reach. Once collected, the eelgrass will be placed in a sample bag filled partially with water.

10. Plankton tow

A plankton net, 50 cm diameter, 150 cm long, submerged 1' - 3' below the water surface will be towed by a boat at a low speed (trolling speed ~ 1 knot) for a period of 5 minutes. The net will be hauled on board the vessel and the collection tube (full of plankton) will be emptied into a 250 ml sample tube and placed on ice.

**Table 2. Anticipated Annual Take for Listed Species**

**Location/Project: Effects of Urbanization of Nearshore Ecosystem in Puget Sound**

<b>ESU / Species</b>	<b>Life Stage</b>	<b>Origin</b>	<b>Take Activity</b>	<b>Annual Number of Fish Requested</b>	<b>Requested Unintentional Mortality</b>	<b>Research Location</b>	<b>Research Period</b>
PS Chinook Salmon	Juvenile	Naturally Produced	Capture, handle, release	50	2 / 50	Waterways and Inlets in east Kitsap County	Sampling will occur once or twice per quarter
PS Chinook Salmon	Juvenile	Artificially Propagated (clipped AD)	Capture, handle, release	100	5 / 100	Waterways and Inlets in east Kitsap County	Sampling will occur once or twice per quarter

**Location/Project: Skagit Delta - Whidbey Basin**

<b>ESU / Species</b>	<b>Life Stage</b>	<b>Origin</b>	<b>Take Activity</b>	<b>Annual Number of Fish Requested</b>	<b>Requested Unintentional Mortality</b>	<b>Research Location</b>	<b>Research Period</b>
PS Chinook Salmon	Juvenile	Naturally Produced	Capture, handle, release	175	9 / 175	Waterways and Inlets of Skagit Delta - Whidbey Basin	Sampling will occur once or twice per quarter
PS Chinook Salmon	Juvenile	Artificially Propagated (clipped AD)	Capture, handle, release	225	11 / 225	Waterways and Inlets of Skagit Delta - Whidbey Basin	Sampling will occur once or twice per quarter